

# The Influence of Cooperative Learning on the Academic Achievement of Chinese Middle School Students

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**Abstract:** This study examines if cooperative learning can achieve better academic scores than traditional lecture-based learning of students in Chinese middle schools. There were 192 randomly selected Chinese middle school students involved in the study. Simple descriptive statistics were used to determine the differences between the treatment and control groups. The results showed that the participants in the cooperative learning group obtained significantly lower achievement scores during the course of the semester. Some discussion about the application, implementation and recommendation of cooperative learning and its impact on educational leaders concludes the paper.

## Introduction

Cooperative learning has been studied for over 100 years, but few studies have been conducted that examine the impact that collaborative learning has on Chinese middle school students (Messier, 2003). As Chinese educators and administrators move into the 21<sup>st</sup> century (and as East meets West), is it important to some of them to try new teaching strategies other than the traditional method. Traditional Chinese instruction places an emphasis on the lecturer and deep learning through memorizing (Marton, Dall'Alba, & Tse, 1996), while cooperative learning strategies demand a facilitator that transfers greater responsibility for knowledge acquisition, organization, and application from the teacher to the student (McKeachie, 2002). This study provides data and perhaps valuable insights to help educators and administrators with decision-making.

The choice to incorporate cooperative learning strategies into an educational program commits the instructor and administrator to a challenging task. Cooperative learning represents a major paradigm shift in focus from what is being taught to what is being learned. This shift in focus and accountability is not an opportunity for the instructor to step back and let things happen. At best, such an attitude would guarantee that very little would get done on the learning level; at worst, it could result in real loss for the student's understanding of cooperative work. Particularly for cooperative learning, careful planning, inconspicuous observation and evaluation, and preplanned adjustments are essential to helping learners move consistently forward (Hardwick, 2000).

The closer, more frequent student-teacher interaction that is inherent in cooperative learning provides teachers occasions for reflective examination of individuals and groups, evaluation of their learning dynamics, and adjustment of instructional plans to achieve the best learning experience for all students. The direct communication between teacher and student increases teacher satisfaction and gives students a greater sense of partnership with instructors in the learning process, as well as increased cognitive, social, and emotional benefits (National Commission for Cooperative Education, 2003). Cooperative learning involves requiring individuals to be accountable so that each participant does a fair share. It involves effective cooperative social skills, effective and appropriate communication skills to bring the task to completion. Research shows that such cooperative learning practices lead to more efficient and effective processing, increased achievement, positive relationships among students, and efficient exchange of information (Johnson, Johnson & Smith, 2000).

In most cases, eastern learning preferences differ from western learning preferences in that there is an important tendency of the Chinese to believe in knowledge and the power of memorizing, which will lead to understanding (Marton, Dall'Alba, & Tse, 1996). Other differences in learning preferences include pupils preferring to work alone rather than in groups, not being asked, or asking questions, to present no overt challenges to authority, and the belief that there is not much value in peer discussion (Tang, & Williams, 2000). The two fundamental reasons for these expectations and attitudes with regard to Chinese education are the respect for superiors and the loyalty to social piety (Pan, Chaffee, Chu, & Ju, 1994).

With an added emphasis on improving outcomes in education, the skilled instructor and administrator

continually searches for effective instructional procedures. In China, the lecture is a traditional, common, and familiar teaching technique and can be fairly effective, especially when a lecturer is well prepared for an oral presentation on topics he/she is qualified to teach. If executed correctly, cooperative learning teaching strategies can also provide fairly effective learning outcomes. Today, little is known specifically about how cooperative learning affects the academic achievement of Chinese middle school students. This study presents the research findings from an investigation of 192 participating middle school students regarding the question, "Can cooperative learning be more effective than traditional lecture-based learning in Chinese middle school students?"

## **The Study**

The purpose of this study is to share the findings about effective teaching strategies with the participating Chinese schools in Macau, China. Three Chinese middle schools participated in this study during the summer of 2003. English as a second language was the chosen subject. Six equally skilled university students from the Faculty of Education (University of Macau) were trained to teach the pupils by two teaching methods: traditional lecture (control group) or cooperative learning (treatment group). Each participating school was randomly assigned two sections of students (control and treatment) and two assigned teachers who taught only the traditional style or the cooperative learning style. For all the students, total instructional-contact time was 52.5 hours. A total of 15 lessons (lesson plans, handouts and presentations) on grammar basics were designed and equally shared so that there were no differences between the teaching content for the treatment and control groups. Each lesson lasted approximately 3.5 hours, three days a week for five weeks.

## **Methodology**

This study was limited to 12-14 year old students (primary 5-7) who were enrolled in Choi Kou, Yuet Wah, and the University of Macau middle schools. All of the students (treatment and control groups) were randomly assigned from a summer school list and randomly allocated into two sections per school. Each middle school's section started out with approximately the same number of students, 36-42 (a normal class size for students in China). An anonymous survey was developed and implemented the first day of class to garner information about each student's background and demographic factors. Five evaluation assessments and one final exam were designed and equally shared so that there were no differences between the assessment content for the treatment and control groups. The five assessments (50% of the final grade) were given on every Friday covering previously learned material. The format of the five assessments included fill-in-the-blank as well as multiple-choice questions. On the last day of class both treatment and control groups were given the same final exam (50% of the final grade), which comprehensively evaluated the semester's work. Since there are many different types of schools (K-12) independent from Macau's government schools, there is no designated Macau school system. Therefore, Macau does not have standardized ESL base-line test scores. For this study, previous traditional lecture-based semester grade scores were used for the base-line data.

Teachers were trained equally in quality and quantity for both treatment and control groups. Teachers who used the cooperative learning method taught pupils in groups of three or four. These teachers were taught to make each group member responsible for a unique part of the group's task and to have students be individually responsible for their own learning. Further, the cooperative learning teachers were given examples of how students can learn from each other in many ways: by giving and receiving help, by recognizing and resolving contradictions between their own and other students' perspectives, and by internalizing problem-solving processes and strategies that emerge during group work (Messier, 2003). Teachers who used the traditional lecture were also trained in workshops to make sure that each instructor was well prepared to present qualified lectures on each grammar lesson. All instructors for the treatment and control groups were given the same content materials (PowerPoint slides, handouts and other teaching materials) and used them equally so that there were no differences between teachers.

To answer the hypothesis question, "can cooperative learning achieve better academic scores than traditional lecture-based learning in Chinese middle schools," a simple quantitative analysis was done to determine differences between treatment and control groups. Our hypotheses are:

Null hypothesis (**H<sub>0</sub>**): The treatment group is not better than the control group.

Alternative hypothesis (**H<sub>a</sub>**): The treatment group is better than the control group (our objective).

Although this study was limited to one study and although not representative of a large sample, its real value is that other educators and administrators can gather useful information from it. Tables were created to show the demographic factors and any improvement in scores for treatment and control groups.

## Demographic Data

Analysis of randomized experimental data does not require controls for background characteristics. Such controls are necessary only when one doubts that the experimental data are truly random (Trochim, 2002). However, the data set may be of interest to the participating Chinese middle schools in Macau, China. Although not all students answered every question, the data collected could provide valued information to the decision makers at the schools involved.

The demographic survey garnered 220 completed questionnaires. Of the 220 students, twenty-eight participants dropped the course, which leaves a sample of 192 students. The response rate is around 87.3 which is satisfactory. All 192 students finished the semester studying basic grammar. Some participants at certain schools did not answer all the survey questions about living with both parents, if both parents worked, or if parents worked as professionals or nonprofessionals. This may lead to extremely imprecise estimates that do not allow for any confident assertion about demographic effects. From the background data, all of the respondents were Chinese nationals and were either born in Macau (Portuguese-Chinese) or other Chinese provinces or special administrative regions (SAR). 80% of the respondents were born in Macau, 16% in China, and 4% in Hong Kong. 95% of the respondents lived with both parents, 4% lived with just one parent, while 1% of the students did not answer this question. Social economic data was collected about the participants by asking them about their mothers and fathers professions. Professional and nonprofessional categories were created by the following student entered criterion: *professional* (government worker, business owner, management, teacher, engineer) and *nonprofessional* (housewife, clerk, construction worker, watchman, factory worker, taxi driver, cook, carpenter, food service, police, fireman).

The student demographic data per school in our treatment and control samples are presented in the first five columns of Table 1 and the first seven columns of Table 2. In columns (2) and (3) of Table 1, on average, both treatment (99%) and control groups (91%) had large numbers of participants living with both parents. Columns (4) and (5) of table 1, on average, show that both treatment (41%) and control groups (47%) had a smaller number of pupils with both parents working. Exploring more deeply into the social economic data of the control and treatment groups, total average, Table 2, columns (2) and (5) describe that 69.9% of all students had parents working in the nonprofessional field while 30.1% worked professionally.

(1) Middle School	(2) % Living with both parents (Control)*	(3) % Living with both parents (Treatment)*	(4) % Both parents work (Control)*	(5) % Both parents work (Treatment)*
Choi Kou	89	100	22	29
Yuet Wah	96	98	57	48
University of Macau	88	100	63	46
Average*	91	99	47	41

**Table 1: Middle schools student background and demographic factors for control and treatment in %.**

(1) Middle School	(2) % of Parents Working in Professional Fields (Total)	(3) # of Parents Working as Professionals (Control)	(4) # of Parents Working as Professionals (Treatment)	(5) % of Parents Working in Non-professionals Fields (Total)	(6) # of Parents Working as Non-professionals (Control)	(7) # of Parents Working as Non-professionals (Treatment)	(8) Total # of Respondents for Working Professionals & Non-professionals
Choi Kou	28.5	06	18	71.3	28	32	84
Yuet Wah	37.9	11	22	62.1	30	24	87
University of Macau	23.8	4	1	76.2	6	10	21
<b>Total Average</b>	<b>Average % 30.1</b>	<b>Total # 21</b>	<b>Total # 41</b>	<b>Average % 69.9</b>	<b>Total # 64</b>	<b>Total # 66</b>	<b>192</b>

**Table 2: Middle schools student background and demographic factors for two sections of control and treatment groups.**

## Results

The results reported below provide information from a randomized field study on academic achievements between cooperative learning and traditional lecture-based learning within Chinese middle schools in Macau. Since, all of the respondents were Chinese nationals, either born in Macau or other Chinese provinces or special administrative regions, this study finds that most students who participated had similar backgrounds and demographic factors. However, in column (2) of Table 2, the data shows that Yuet Wah had a higher number of parents working as professionals (37.9 %) and a lower number working as nonprofessionals (62.1) than either Choi Kou (28.5, 71.3) or University of Macau (23.8, 76.2) middle schools. Also, there may be intangible factors that account for a self-selection problem (a problem for researchers that arises when a population differentiates itself by freely selecting a particular situation, in this case, cooperative learning). How can one be sure that the findings are not due to the self-selected character of the population, not the education intervention? The best solution to the self-selection problem is the random assignment of students to treatment and control groups (Bifulco, 2002).

When interpreting the results, it should be noted that there are many aspects of the level and quality of educational resources that may influence student performance, of which teaching method is only one. Moreover, the assessment exams were designed to test concepts in grammar basics covered during the middle school years, further minimizing the potential bias resulting from this form of measurement error.

In the columns of Table 3, actual average scores and data are reported for each middle school. In columns (2) and (3), the total average analysis yielded a reliable main effect for control groups reporting a mean of 59.3, while the treatment groups reported a mean of 55.1. In column (6) of Table 3, all t values for each school were negative for both control and treatment groups. Given that t values are the result of the difference between the two groups, the negative t values support the null hypothesis (achievement scores from cooperative learning methods will be less than or equal to the lecture-based learning methods), which cannot be rejected.

As is evident from Table 3, all three individual schools averaged scores show that lecture-based teaching strategies (59.3) have higher achievement grades than cooperative learning teaching methods (55.1). In column (5) of Table 3, standard deviations for both schools' treatment groups (Choi Kou, 20.2 and Yuet Wah, 15.8) are lower than the standard deviation for the schools' control groups (Choi Kou, 17.2 and Yuet Wah, 14.2). Conversely, University of Macau Middle School's standard deviation is higher for the treatment group, which may indicate and support the idea that the treatment (cooperative learning method) is not of no value. We will explain this in more detail later. Column (8) of Table 3 shows that base-line semester scores for the last three years were higher than the average scores for control (59.3) or treatment (55.1). Choi Kou had three years of higher averaged scores (67, 66, 67) than Yuet Wah (64, 62, 65). With a higher score than both, Choi Kou or

Yuet Wah, The University of Macau's Middle School (in their first year of running their middle school program) reported an average score of 73.

(1) Middle School	(2) Lecture-Based Average Scores (Control)	(3) Cooperative Average Scores (Treatment)	(4) Sample Size N	(5) Standard Deviation		(6) t-Value	(7) P-Value	(8) Base-Line Scores Last 3-Years (Average)**		
				(C)	(T)			01	02	03
Choi Kou	54.2	51.8	84***	20.2,	17.2	-0.566	0.287	67	66	67
Yuet Wah	64.9	59.3	87***	15.8,	14.2	-1.688	0.048	64	62	65
University of Macau	59.5	47.6	21***	15.6,	16.4	-1.700	0.053	73*		
<b>Average</b>	<b>59.3</b>	<b>55.1</b>	192***							

**Table 3: The average final semester scores of cooperative learning vs. lecture-based learning**

Table 4 presents combined descriptive statistics of the dataset. In columns (1), and (4), the control group exhibits the same pattern of higher average achievement score and standard deviation. Column (5) describes the standard deviation of the between-grade difference in both treatment and control groups at 2.5. Column (6) shows a continued negative pattern for combined t values, also confirming that we can not reject the null hypothesis that the averaged scores for the treatment groups are less than or equal to the averaged scores for the control groups.

(1) Combined Lecture-based Average Scores (Control)	(2) Combined Cooperative Average Scores (Treatment)	(3) Sample Size	(4) Standard Deviation		(5) Std. Error Difference	(6) t-Value	(7) P-Value
			(C)	(T)			
59.3*	55.1*	192***	18.5,	16.2	2.5	-1.66	0.049

**Table 4: The combined average final scores of the three middle schools (cooperative learning vs. lecture-based learning).**

### Generalization and Discussion

One must qualify any generalizations from the results of this single study to the population of the three middle schools in Macau. Only a small fraction of Macau's pupils were studied. A larger-scaled vigilant research study that would involve many more schools and children over a longer time frame within Macau's middle schools could conceivably have quite different educational outcomes.

School systems around the world differ in many respects. How ESL standardized base-line data is gathered is a good example, a common practice in the United States and other countries, yet in Macau, China (due to its irregular school system), not a practice valued as important or practical. Variation in learning preferences is another difference. How students learn, value peer discussion, work in groups, and ask questions all may have significant effects on academic achievement in school systems.

Given these differences, it is not obvious that findings from any particular school or study translate directly into general principles for other school systems to follow. The data collected met stringent requirements, including the randomized selection of students with similar demographic background, age, instructional-content, grade-level as well as using the same achievement tests. A good deal of time was also

taken to make sure that the curriculum framework was set up to ensure that the test content was appropriate and reflected students' current curriculum for both the treatment and control groups. In Table 2, column 2, it was interesting to note Yuet Wah's percentage of parents working in professional fields (37.9 %), which was the highest, versus University of Macau's middle school percentage, the lowest (23.8 %) and Choi Kou not far behind at 28.5 %. Is there a correlation to this and achievement? Unfortunately, this question is beyond the scope of this investigation may need further study.

Most schools in Macau are very traditionally based in their educational practices. An interesting observation about the Yuet Wah middle school is that its achievement scores outperformed the other two schools in both treatment and control groups, as reported in columns (2), (3), and (5), of Table 3. The reason may be as simple as understanding that certain schools in Macau have been around longer than other schools and may hold more value for parents to send their students to those particular schools. As a result, some schools like Yuet Wah are limiting the number of students that can get in. This may have a positive bias on the level of student or standard of student that goes to Yuet Wah. Further evidence to this is Yuet Wah's standard deviation, which is lower than Choi Kou's and reflects a closer range of students who are achieving higher scores. As mentioned earlier, University of Macau's middle school also had a better standard deviation score than Choi Kou's, but it was analyzed from a lower number of students, as column (4) in Table 3 indicates. As a new school with little history, University of Macau's middle school may be willing to accept new teachers who accept nontraditional methods of teaching. Thus, affecting the lower standard deviation for the control group, as Table 3, column (6) points out.

Although there was a statistically significant difference in standard deviations between control and treatment groups at Choi Kou (20.2, 17.2) and Yuet Wah (15.8, 14.2), Choi Kou had a greater difference of 3 units. Based on a smaller number of participants, University of Macau middle school's standard deviation difference was also smaller. As a consequence, we can not say for sure that the treatment (cooperative learning) is not of no value. Cooperative learning may help to reduce the large difference in academic performance of the Chinese students.

In column (8) of Table3, base-line average scores for the past three years reflect higher semester achievement for all schools than for this study. From these averages, Choi Kou scores slightly higher than Yuet Wah, and University of Macau middle school, higher than Choi Kou and Yuet Wah. In contrast, would an ESL standardized test given to each beginning middle school class reflect different levels of teaching and learning? Further studies could answer this question. For future implementation, the Macau government has adopted a Chinese language standardized test for high school seniors, which could reflect achievement in that particular discipline. It may be of interest to do the same thing for ESL standardized testing, and it is highly recommended by this author.

Educators and administrators who seek to explore new teaching techniques that empower students to be more responsible may want to explore cooperative methods for their pupils. This exploration is being done in Singapore, Hong Kong and Taiwan (Tang & Williams, 2000). While it is still not clear if the negative treatment findings indicate traditional-based learning can provide higher achievement scores, it is hoped that additional research will accompany larger studies to establish if cooperative learning is an appropriate teaching method for Macau's schools.

## **Conclusion and Recommendation**

As a consequence, the findings presented here on cooperative learning and achievement scores provide a unique opportunity to examine traditionally based schools in Macau, China. To answer the question, can cooperative learning achieve better academic scores than traditional lecture-based learning in Chinese middle schools? Since the University of Macau's middle school standard deviation was lower (16.4) than Choi Kou's (17.2) for the treatment, this may indicate that the treatment (cooperative learning method) is not of no value. Further, we also have combined negative t values in Table 4, column (6), validating the  $H_0$  (achievement scores from cooperative learning methods will be less than or equal to the lecture-based learning methods), which cannot be rejected.

Numerous previous studies show the benefits of cooperative learning pedagogy (Hardwick, 2000). Collaborative pedagogy can be a rewarding experience if certain factors are incorporated into the teaching strategy. A skillful facilitator, capable of balancing guidance with flexibility, is one crucial factor. Another is a group with the skills, both technical and social, to truly collaborate in the learning process. When those crucial factors as well as other pedagogical issues come together in a learning setting, collaborative learning can result

in a product exceeding the expectations of the teacher. It is hoped that readers of this study will try cooperative learning as one of their tools in class. As educators seek to make decisions about using cooperative learning, it is hoped that administrators and faculty alike can gain valuable perspectives and insights for the decision process.

In the early years of the new millennium, education and the tasks and responsibilities of educational leaders and administrators are changing and becoming more demanding. In every country, the imperative to improve educational achievement is increasing, and at the same time, the world that young people and adults are being educated for is changing radically. The use of new methodologies, the growth of knowledge economies, the need to safeguard the environment, increasing insecurity (social, political and economic), are all changing the nature and purpose of education. These changes have important implications for all educational leaders and administrators. In consequence, the work of researchers in gaining new understandings of the ways in which schools adopt new teaching methodologies is all the more significant. Gaining new understandings in education may require researchers and administrators to improve existing methodologies or to create new approaches to their pedagogy.

Reports and recommendation workshops were administered to the three participating middle schools and the Department of Education and Youth, to encourage their exploration into further research and projects stimulated by this study and cooperative learning. Demographic data and the findings about this research were presented in table and HTML form. All participants were presented with an investigation resource kit about the study that included a CD (lesson plans, pedagogy resources and the study), notebook (the report) and a participating certificate. Finally, during the workshop presentation, it was highly recommended to the observers that:

- middle-school faculty explore empirical research studies about teaching and learning strategies,
- all workshop participants look into the creation and implementation of a standardized ESL assessment exam (designed for Chinese middle-school students starting in Form 2, grade 8),
- all workshop participants look into the creation and implementation of an ESL middle school council to further develop effective ESL teaching and to encourage and educate other middle schools in Macau to participate in it,
- all workshop participants to implement a Chinese cooperative learning middle school network.

## References

Bifulco, R. (2002). Addressing Self-selection Bias in Quasi-Experimental Evaluations of Whole School Reform. Center for Child and Family Policy, Duke University. Retrieved July 11, 2003, from <http://www-cpr.maxwell.syr.edu/efap/Publications/Addressing%20Self%20Selection%20Paper.pdf>

Council for Exceptional Children. (2003). How Cooperative Learning Works for Special Education and Remedial Students. Retrieved July 20, 2003, from <http://journals.cec.sped.org/EC/Articles/Article-2.pdf>

Doo, I. (2000). *Collaborative Learning Activities Manual*. Boston, MA: Addison-Wesley.

Hardwick, S. W. (2000). Humanising the technology landscape through a collaborative pedagogy. *Journal of Geography in Higher Education*, 24(1), 123-129.

Harris, P. (2000). Using Technology to Create a New Paradigm for a Learner-Centered Educational Experience. *Technos: Quarterly for Education and Technology*, Summer, 2000.

Johnson, D. W., Johnson, R., & Smith, K. (2000). Constructive controversy: The educative power of intellectual conflict. *Change*, 32(1), 28-37.

Kemery, E. R. (2000). Developing on-line collaboration. In Aggarwal, A. (Ed.), *Web-based Learning and Teaching Technologies: Opportunities and Challenges* (pp. 227-245). Hershey, PA: Idea Group Publishing.

Marton, F., Dall'Alba, G. and Tse, L.K. (1996). Memorising and Understanding: The keys to the paradox. In D.A.E.Watkins and J.B.Biggs (Eds), *The Chinese Learner: Cultural, Psychological, and Contextual Influence*. Melbourne, Australia: Australian Council for Educational Research.

McKeachie, W. J. (2002). *Teaching Tips: Strategies, Research, and Theory for College and University Teachers*. Boston, MA: Houghton Mifflin Company.

Messier, W. P. (2002). Learning Cubes: A Model for Online Education. World Conference on E-Learning in Corp., Govt., Health., & Higher Education. Retrieved July 21, 2003, from <http://dl.aace.org/9710>

National Assessment Governing Board US. (2002). Reading Framework for the 2003 National Assessment of Educational Progress, Department of Education. Washington, DC. Retrieved July 16, 2003, from [http://www.nagb.org/pubs/reading\\_framework/ch4.html#2](http://www.nagb.org/pubs/reading_framework/ch4.html#2)

National Commission for Cooperative Education. (2003). Executive Forum Report. Retrieved July 08, 2003, from <http://www.co-op.edu/monograph.html>

New York State United Teachers. (2003). How Kids Learn Best: Scientific Research Sheds Light on Effective Teaching strategies. Latham, New York. Retrieved July 18, 2003, from <http://www.nysut.org/newyorkteacher/2002-2003/030604learning.html>

Pan, Zhongdang, Steven H. Chaffee, Godwin C. Chu, and Yanan Ju. (1994). *To See Ourselves: Comparing Traditional Chinese and American Cultural Values*. San Francisco, CA: Westview Press.

Tang, T. and Williams, J. (2000). *Who have better learning styles – East Asian or Western Students?* (pp. 318) Proceedings of the 5th ELSIN Conference, Hertford, 2000.

The National Center for Education Statistics. (2003). The Nation's Report Card, Writing. Institute of Education Science, Department of Education. Washington, DC. Retrieved July 16, 2003, from <http://nces.ed.gov/nationsreportcard/writing/achieveall.asp>



Smith, B. L. & McCann, J. (2001). *Reinventing Ourselves: Interdisciplinary Education, Collaborative Learning, and Experimentation in Higher Education*. Bolton, MA: Anker Publishing Co.

Thousand, J. S. (2001). *Creativity and Collaborative Learning: A Practical Guide to Empowering Students and Teachers*. Baltimore, MD: Paul H Brookes Publishing Company.

Trochim, William M. K. (2002). Two Group Experimental Designs. Department of Policy Analysis and Management. Cornell University. Retrieved July 16, 2003, from <http://trochim.human.cornell.edu/kb/expsimp.htm>